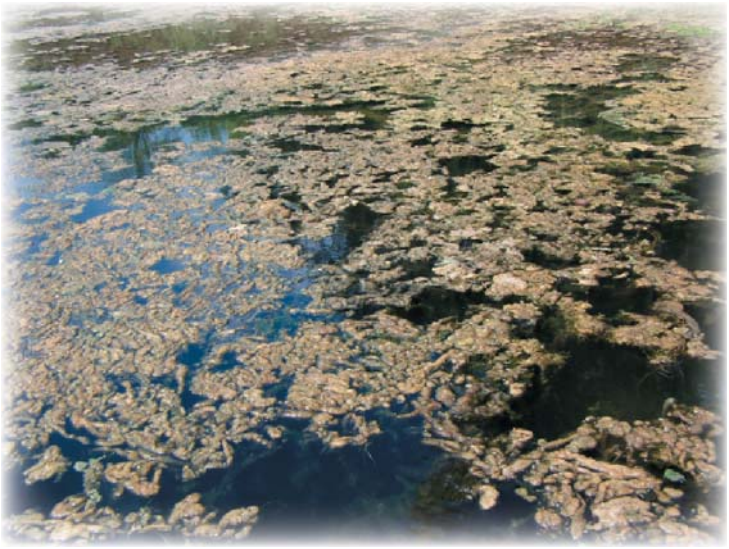

Ecozone Feasibility

Lake Tippecanoe
Kosciusko County, Indiana

Prepared for:

Lake Tippecanoe
Property Owner's
Association
(LTPO)

January 2007

(revised)

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APPENDICES

Executive Summary

An Ecozone Feasibility Study was conducted as the result of an Indiana Department of Natural Resources (IDNR) Lake and River Enhancement (LARE) Program funding to determine the best location and parameters for Ecozones in Lake Tippecanoe and the amount of community support for these Ecozones. The establishment of the Ecozones will allow the native emergent and floating vegetative communities that have been lost due to recreational activities to become reestablished. Residents have reported loss of these native aquatic plants in one area in particular, the Ball Wetlands area.

As a response to the increasing concern of algae growth, an initial meeting between the LTPO Aquatic Weed Committee Chair and IDNR representatives was held in late 2005 to talk about the algae situation along the Ball Wetlands. Discussion took place that algae treatment alone would not be the solution to the problem. The algae would come back after treatment if no other plants were introduced to take up the nutrients as the growing conditions and nutrients in the lake water would remain. At this time a more permanent and effective solution in the form of an Ecozone was brought up including re-vegetation of this area with native aquatic plants.

After inspection of this locale, the area to the east and west of the Ball Wetlands and a small cove to the north of the western portion were chosen for the Ecozones. These locations remain consistent for the three Ecozone alternatives developed to determine which one best suits the community's concerns. Favored by the participants of the public meetings, Alternative One protects vegetation on the east side of the Ball Wetlands, while extending far enough west of the wetlands and north of the channel to protect shallow areas allowing aquatic plant revegetation. Regarding Alternative Two, public meeting participants thought the areas east of the wetland and north of the channel were fine, however, they did not want this alternative because the enforcement of the "idle only" zone would be too difficult if not impossible. Landowners also thought these boundaries would be confusing to lake users. As with Alternative Two, the public was satisfied with the eastern and northern boundaries in Alternative Three, but felt the area west of the Ball Wetlands in this alternative did not provide enough protection.

Petitioning IDNR for Ecozones resembling those in Alternative One is anticipated in the beginning of 2007. Establishing the Ecozones and the subsequent return of native aquatic plant communities will result in the restoration of wetlands, providing habitat and an overall improvement in water quality, ultimately improving the quality of life on Lake Tippecanoe.

1.0 INTRODUCTION AND ECOLOGICAL HISTORY

Lake Tippecanoe, located in Kosciusko County, Indiana (Figure 1 & 2), is the deepest natural lake in Indiana with a maximum depth of 123 feet (38m) and is one of the state's largest glacial lakes. Lake Tippecanoe (Figure 3) is part of the Tippecanoe River watershed which flows into the Wabash River near Lafayette, Indiana. The Wabash River is a tributary of the Ohio River.

FIGURE 1: Location of Kosciusko County within Indiana

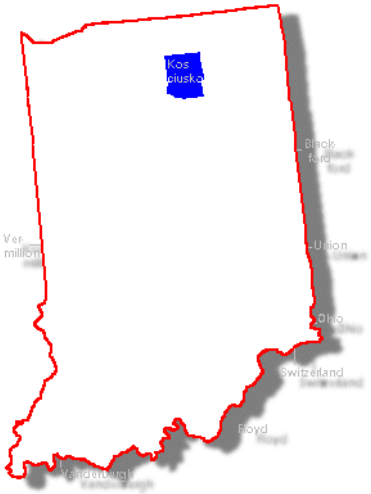

FIGURE 2: Location of Lake Tippecanoe within Kosciusko County

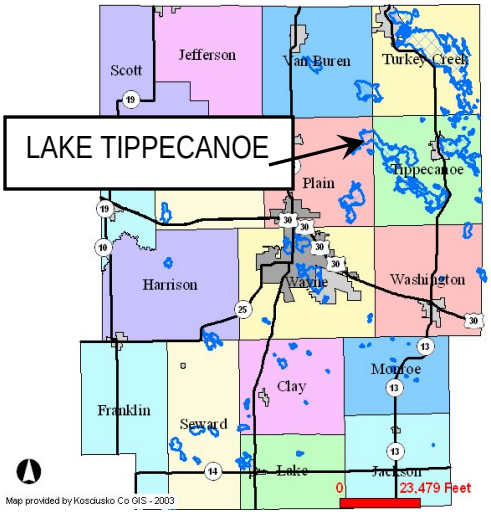

FIGURE 3: Lake Tippecanoe and surrounding area

The Lake Tippecanoe Property Owners (LTPO) and the Tippecanoe Environmental Lake and Watershed Foundation (TELWF) have been active in numerous projects over the years to improve water quality in the lake. This Ecozone Feasibility study was funded by a grant through the Indiana Department of Natural Resources, Division of Fish and Wildlife, Lake and River Enhancement Program (LARE).

Several of Lake Tippecanoe's lacustrine wetlands have been lost to development over the years, with the largest loss occurring between 1965 and 1985 (Figures 4-8). The wetlands and plant growth lost over the years is illustrated in Figure 9.

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N
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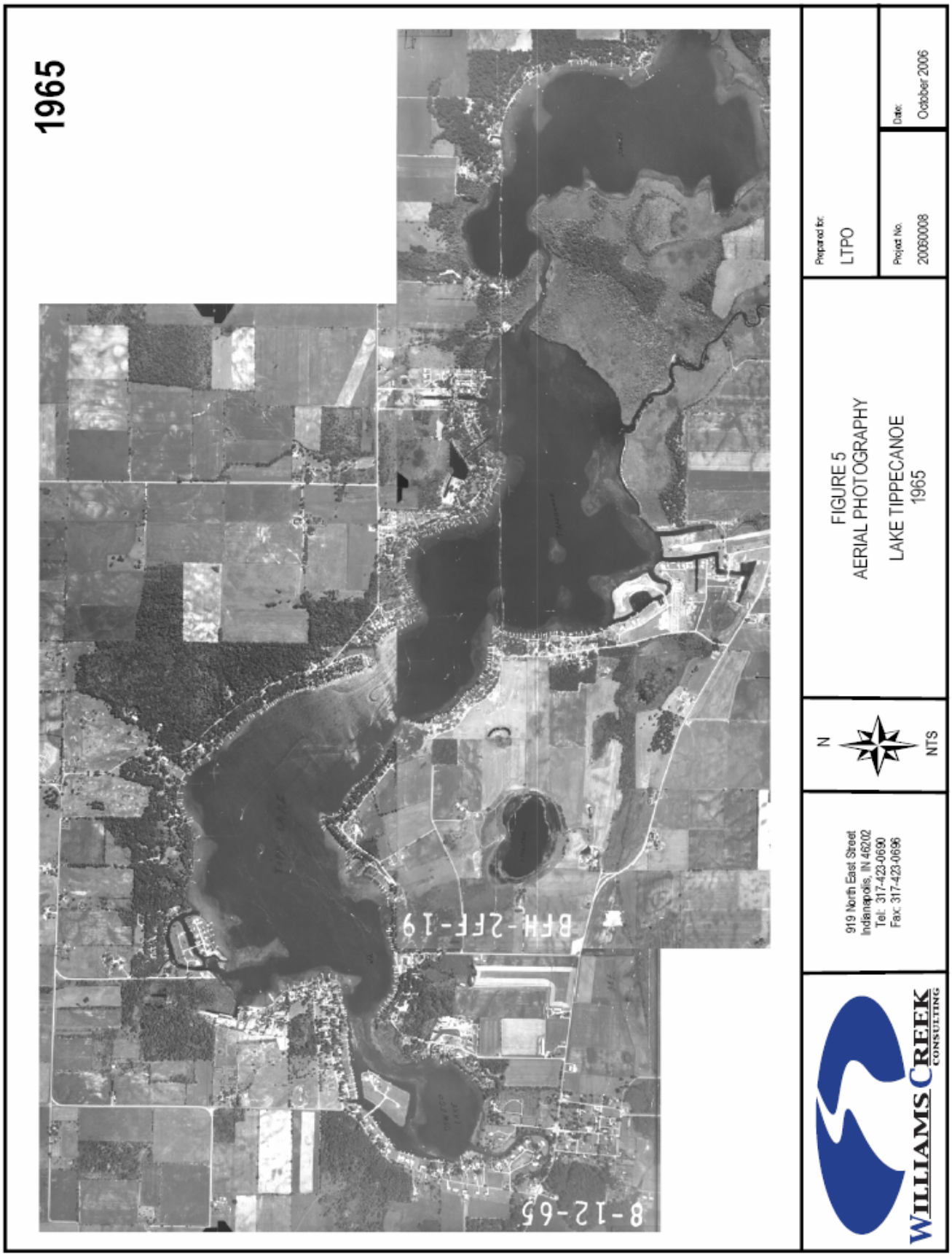
FIGURE 4
AERIAL PHOTOGRAPHY

LAKE TIPPECANOE
1938

Prepared for:
LTPO

Project No.
20060008

Date:
October 2006


1965
8-12-65
BFH-2FF-19
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Fax: 317-423-0696
N
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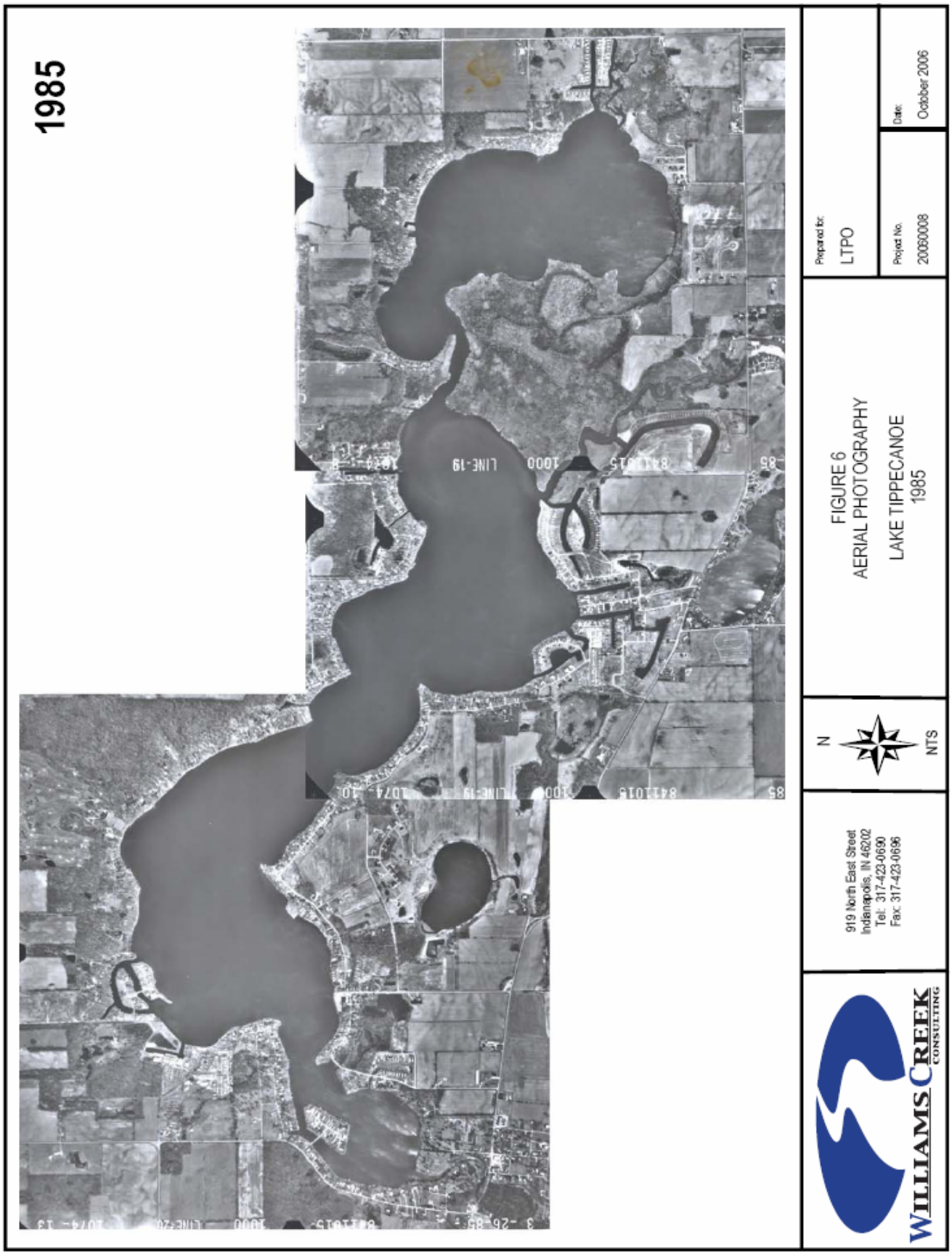
FIGURE 5
AERIAL PHOTOGRAPHY
LAKE TIPPECANOE
1965
Prepared for:
LTPO
Project No.
20060008
Date:
October 2006


1985
FIGURE 6
AERIAL PHOTOGRAPHY
LAKE TIPPECANOE
1985
Prepared for:
LTPO
Project No.
20060008
Date:
October 2006
N
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1996

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FIGURE 7
AERIAL PHOTOGRAPHY

LAKE TIPPECANOE
1996

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Project No.
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Date:
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2005

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FIGURE 8
AERIAL PHOTOGRAPHY

LAKE TIPPECANOE
2005

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FIGURE 9
AERIAL PHOTOGRAPHY

ECOLOGICAL CHANGE
60 YEARS OF IMPACTS

Prepared for:
LTPO

Project No.
20060008

Date:
October 2006

As increases in regulation began to curb development in ecologically sensitive wetland areas, Lake Tippecanoe's wetland and littoral zones (shallow water, near shore areas) still continued to suffer losses due to various recreational impacts. One such littoral zone that has incurred significant ecological change is the area west of the Ball Wetland Complex, known by local residents as "The Flats" (Figure 10).

FIGURE 10: Location of the Ball Wetlands and "The Flats"

Comments from numerous long time lake users and property owners confirm that The Flats has been a popular place to water ski, barefoot ski, wakeboard, and for tubing activities for at least 50 years. The residents have reported that as the skiing activity increased in this area over the years the rooted aquatic plants have steadily decreased. This area was historically characterized by dense stands of emergent vegetation such as softstem bulrush (*Scirpus validus*) and floating vegetation such as water lily (*Nymphaea odorata*) (Figures 11 and 12).

FIGURE 11: 1947 historical photo, Grassy Creek from bridge on Armstrong Road, looking north

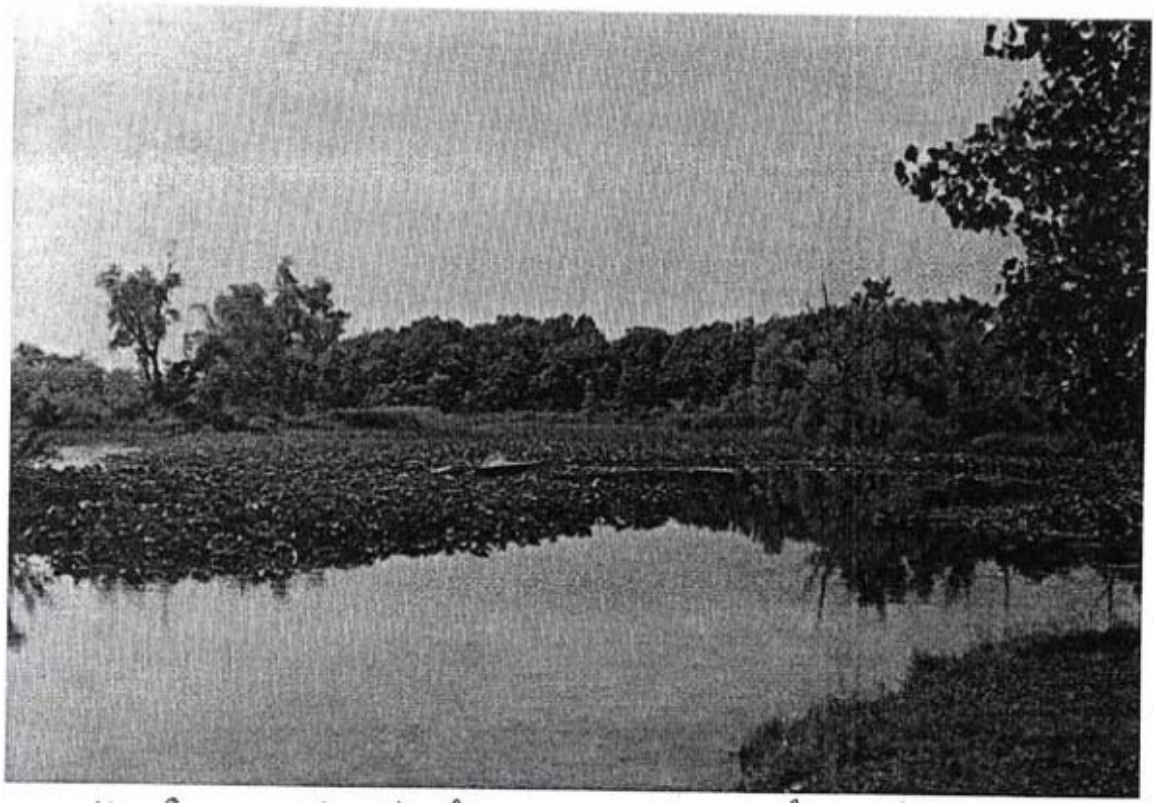
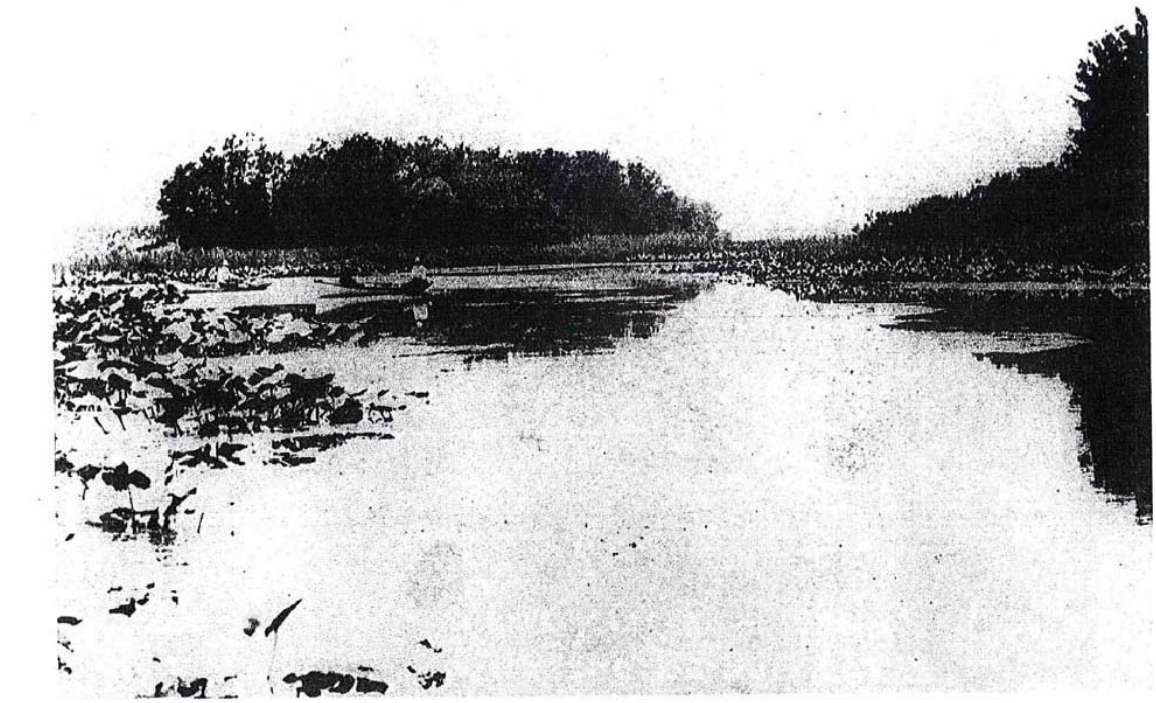


FIGURE 12: 1910 historical photo, Grassy Creek connecting Tippecanoe Lakes and the Barbee Lakes



Concern among residents and lake association leaders regarding the decline of this vegetation and the subsequent replacement of it with mats of filamentous blue-green algae initiated this feasibility study and overall interest in more comprehensive plant management strategies (Figures 13 and 14). Late in 2005, LTPO met with DNR representatives to discuss treatment of the algae in The Flats area. The treatment of the algae alone would not be a solution for the problem. The growing conditions for the algae would still exist, without other vegetation to take its place or tie up the nutrients, the algae would return. It was felt a more permanent solution to take up the nutrients is needed. One plant management strategy gaining interest statewide is the creation of "Ecozones." An Ecozone in The Flats would entail limiting recreational impacts via recreational zoning restrictions and the subsequent exploration of restoration alternatives for the emergent and floating leaf plant community. The guiding ecological principles and concerns conveyed about changes at The Flats are associated with:

- the decline in aquatic habitat,
- the decline in more seasonally permanent storehouses for nutrients, and
- the overall decline in water quality demonstrated by the presence of blue-green algae blooms.

FIGURE 13: 1998 photo of east side of Ball Wetlands from Lake Tippecanoe

FIGURE 14: 1998 photo of north side of Ball Wetlands from channel

A check of LTPO records confirmed that the area has never been dredged or chemically treated. After reviewing information from the United States Geological Service (USGS) lake gage 03330480 (Figure 15) Tippecanoe River at Oswego, IN lake-level data for the years 1942-2002, it was observed that the water level rarely fluctuated more than a foot and a half from the level of 806.40 ft. set by DNR.

FIGURE 15: Location of Gage Station (red dot)

2.0 LEGAL AUTHORITY

According to the Indiana Department of Natural Resources (IDNR), the development of the Ecozones as a lake management tool originated with the statutorily established Lakes Management Work Group in its 1999 final report and recommendations. The report recommended that, because of watercraft impacts to lake ecology, provision for boating restrictions be allowed in lake areas susceptible to damage by watercraft where important rooted aquatic plant beds exist.

Legislation enacted in 2000 (HEA 1075) amended IC 14-15-7-3 to allow for establishment of zones on public waters where the use of watercraft may be limited or prohibited for the purposes of fish, wildlife, or botanical resource management, or for the protection of users. Regulations in 312 IAC 5-6-1 allow for the establishment of zones on specified public freshwater lakes to govern the operation of watercraft for any of the following purposes:

a. Addressing unusual conditions or hazards.
b. Fish, wildlife, or botanical resource management.
c. The protection of users.

In order to be effective, a zone established under this rule must be identified on-site by buoys placed in accordance with 312 IAC 5-4. Watercraft operation may be restricted on specified lakes and reservoirs with state or federal funding under 312 IAC 5-10-1. Ecozones are established through the IDNR's rule making process and are unique to a given lake and given geographic area. The Ecozone's boundaries are fixed geographic points and additional rule-making would need to be undertaken to adjust the boundaries into the future. The boundary lines will be made as straight as possible in order to minimize the number of buoys needed to mark the designated area and to minimize boater confusion.

Petition Process

At the present time IDNR is not initiating the development of Ecozones, unless significant local interest results in a petition to the IDNR to evaluate a lake or lake area and begin the rule-making process. IDNR is requesting that public outreach meetings and at least one meeting with IDNR staff take place prior to submitting a petition. The petition will eventually go before the Natural Resources Commission (NRC) (rule-making body for IDNR) with specific geographical reference points and appropriate maps with a short description of the need, purpose and specific regulation (e.g. no boats, idle only, etc). Given this, the petition should include most of this information, as well as details about the petitioning organization.

The draft petition is reviewed by the NRC for preliminarily approval, after which public hearings are held. Upon the completion of public hearings, the hearings officer reports back to the NRC with his/her recommendation based upon facts and opinions presented at the hearings. The NRC can either: 1) adopt into final rule the preliminary zone, 2) make modifications to the zone, or 3) elect not to proceed with final rule-making on the zone. If the zone is adopted, IDNR then coordinates with the petitioning organization regarding the purchase and installation of the regulatory buoys to mark the zone(s), as appropriate.

3.0 AREAS OF ECOLOGICAL INTEREST

The Lake Tippecanoe Property Owners Association (LTPO) was advised by their contracting herbicide applicator to consider alternatives to restore an area near the Ball Wetlands with native plants. Observations in recent years included a drastic decline in the rooted plant community and an increase in floating blue-green algal mats in this area. These observations from numerous longtime lake residents all indicated that the area in question, west of the Ball Wetlands was previously covered in rooted aquatic plants. Because of the nature of the area, protected from the wind and low wave action, hence the name "The Flats", this area was increasingly popular with skiers and barefoot skiers. The residents have reported that as the skiing activity increased in this area over the years the rooted aquatic plants have steadily decreased. LTPO requested that IDNR visit the lake and look at this area and any other areas of interest for a potential Ecozone(s). IDNR staff, including Mr. Jed Pearson (district 3 fisheries biologist), identified the west side of the Ball Wetlands as a primary area of interest. IDNR staff also expressed some interest in the eastern side of the wetlands (pending the identification of the legal shoreline), as well as a small area in front of the nature preserve on the north shore of the lake. Mr. Pearson and staff mapped all of the emergent beds in Lake Tippecanoe on August 8, 2006. These emergent beds are marked by black squares on the map in Figure 16.

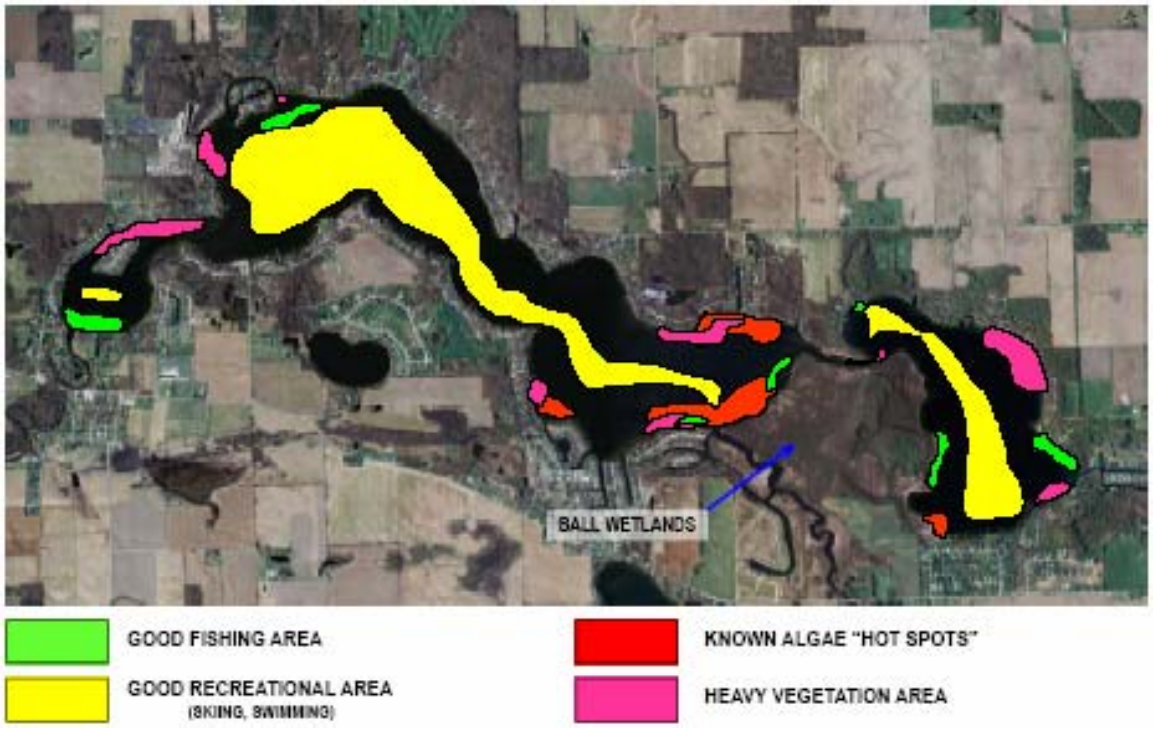
FIGURE 16: Map of Emergent Beds in Lake Tippecanoe

Local landowners have identified three areas that have retained their natural vegetation located in the channel between Lake Tippecanoe and James Lake, in the Grassy Creek, and on the eastern shore of the Ball Wetlands. These areas will be used as control areas for the study. (Figure 17)

FIGURE 17: Potential Control Area with Natural Vegetation in the channel between Lake Tippecanoe and James Lake

Members of LTPO and the general public were also asked to identify areas of the lake for various ecological assets or concerns. This input was solicited at the first public outreach meeting (meeting details below). The public input generated from this meeting is summarized in Figure 18. After considering all input regarding ecological areas of interest, the focus of future Ecozone implementation was narrowed to the area around the Ball Wetlands.

FIGURE 18: Public Input



4.0 SAMPLING AND ALGAE ID

On August 22nd, 2006 quantitative aquatic plant sampling was conducted in the bay west of the Ball Wetlands, along the eastern edge of the Ball Wetlands, and in front of the nature preserve on the north side of the lake. In general, the sample area was based on a bathymetry of the lake, appropriate depths for aquatic plant growth, water clarity, and historical observations of lost plant beds.

FIGURE 19: Bathymetric Map

FIGURE 20: Bathymetric Map (zoom)

Plant sampling included traveling in a zig-zag fashion through the areas of interest and observing plant and algae densities at various random sampling sites.

FIGURE 21: Sampling Points

Densities were determined with a double-headed garden rake as outlined in IDNR's Tier II sampling protocol. Algae collected on the rake (Appendix B) were also assigned a density rating. Plants that were visually observed at the sample sites but not picked up on the rake were assigned a "9" to document their presence. Water depths were also recorded during sampling at select locations. The original field data sheet is included as Appendix B and the scientific and common names for the species codes in Table 1 are listed in Appendix C.

TABLE 1: Plant Sampling Data from "Submersed Aquatic Plant Survey Form Field Data Sheet":

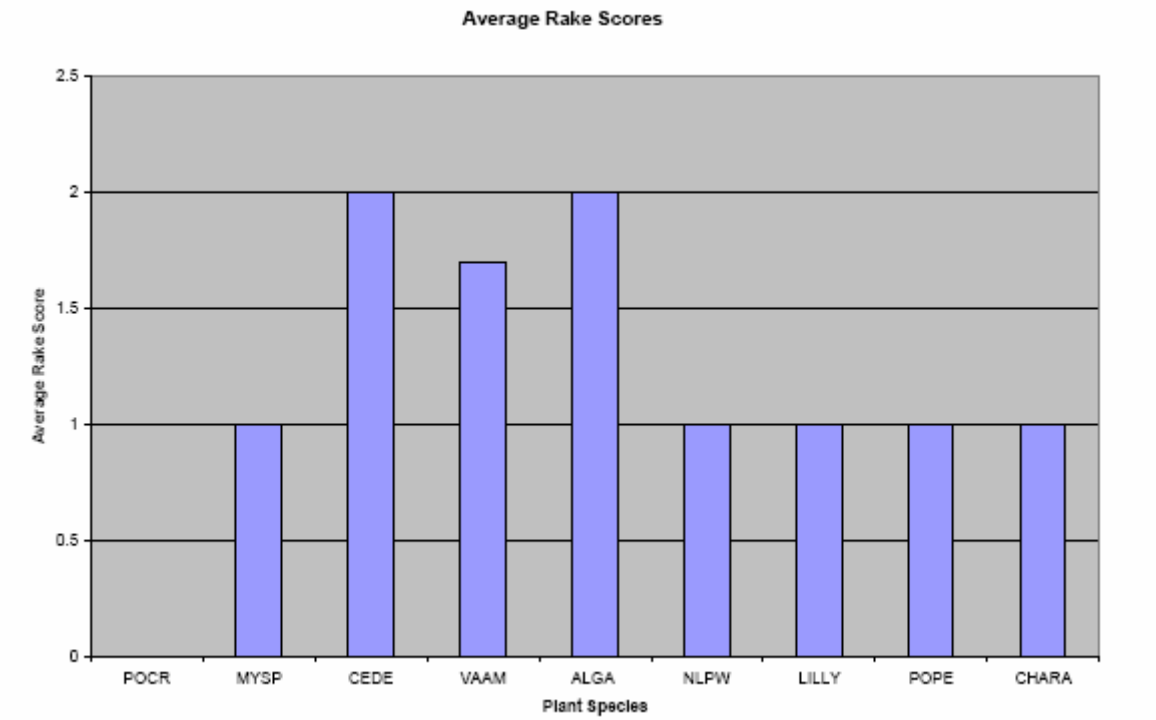
Submersed Aquatic Plant Survey Form

WATER BODY NAME Lake Tippecanoe
COUNTY Kosciusko
DATE 8-22-06
RECORDER Jill Hoffmann/Holly LaSalle

SECCHI 7.8ft.
MAX PLANT DEPTH 6.5ft. in survey area
WEATHER Sunny 85F

Site	Depth	POCR	MYSP	CEDE	VAAM	ALGA	NLPW	LILLY	POPE	CHARA	NOAQVG
1	1			1		3	9				
2	1				1	3		9			
3	1			3			9				
4	1					1	9	1			
5	1			1				9			
6	1					3					
7	4					3					
8	3.5					5					
9	2.5					3					
10	2.5			1		5					
11	2.7		1	1			1	9			
12	5			1		1					
13	2.5			1		3					
14	2.1			3		3					
15	2.5					1					
16	4.2					3					
17	5.2		9	5		1			9		
18	2.5				3	1			1		
19	1.5		9		1	1			1		
20	2	9			1	1					
21	1.8				1	1			1		
22	2.3				1	1			1		
23	2.1				3	1			1		
24	1.7		1		1	1					
25	2.1		9	1	3	1					
26	2.5		9	5		1					
27	2.3									1	
28	6										NOAQVG
29	2.5			1						1	
Average Rake Score		0	1	2	1.7	2	1	1	1	1	

FIGURE 22: Average Rake Scores for the Plant Sampling



The results of the sampling proved what lake users were already observing; while the area west of the Ball Wetlands is suited for rooted plant growth like water lilies, it is now dominated by algae and a non-rooted plant called coontail (*Ceratophyllum demersum*). Of the twenty-nine (29) sample sites inventoried, 21% contained nothing but dense filamentous algae, 52% contained only filamentous algae or non-rooted coontail, and only 10% of the sites contained a moderately dense rooted native plant community. Based on depth and light penetration, this area should be dominated by rooted and floating-leaved plants. A healthy plant community in this location would serve as important fish spawning/rearing grounds and more importantly, as a nutrient storehouse/sink during the summer months. It is WCC's opinion that damage to historic communities in this area has given algae a competitive edge. In addition to being a nuisance, an algal dominated community is often not good for the lake ecology or human health.

Samples of the dominant algae present in the study area were sent to Green Water Labs in Florida for species identification. The community is dominated by a benthic (bottom dwelling) cyanobacterial (blue-green algae) genus, *Lyngbya*, found in both freshwater and marine environments. The specific *Lyngbya* species dominating the area west of the Ball Wetlands was identified as *Lyngbya wollei. Various* species of the *Lyngbya* genus, including *Lyngbya wollei,* contain toxins that are harmful to humans and animals. These toxins can be irritating to the skin,

respiratory system, and digestive system. Algal toxins in high concentrations can pose threats much greater than irritation when ingested or inhaled.

If the lake association was only interested in treating the algae, the following information is provided by their contracted herbicide applicator. The treatment would begin with a test called an algal challenge, the researchers take water from the lake and the algae and apply different doses of many different algaecides in order to come up with a proper recommendation. The cost for the test is approximately $1,000. The following price quotes would be contingent on the recommendations of the algal challenge test. Costs would range from $200-$1,000 per acre per treatment. This treatment may have to be repeated every 4-8 weeks during the growing season. The cost would be $10,000-$50,000 per treatment.

If the alga was to be treated with alum, the entire lake would need to be treated. In order to apply 7.5 mg/L of alum you would need over 1.5 million gallons of liquid alum. The cost of doing this treatment along with product would be over $2 million.

5.0 PUBLIC INVOLVEMENT

Public involvement included mailing meeting notices to all Tippecanoe property owners, approximately 1,400 addresses. The mailings were not limited to LTPO members, but sent to all property owners. The public meeting flyers, ecozone informational sheet and survey, survey results, and news article are included as Appendix D. Two public meetings/educational presentation were conducted to build ecological understanding and explain the Ecozone rulemaking process.

Meeting 1
The first meeting was held at the Lake Tippecanoe Country Club and coincided with the LTPO annual meeting on July 8th, 2006 at 9 a.m. There were 76 people in attendance with all of the surrounding lake “landings” (neighborhoods) represented. A presentation was given explaining the various ecological connections between plant communities, algae, and water quality. The presentation also highlighted historical changes to adjacent wetlands, inlet channels, and emergent plant communities. A few interactive activities were part of the overall event, including an exercise where citizens used colored flags to identify the following: good fishing habitat, prime recreational areas, areas known to have too many plants, and algae “hot spots” (i.e. concentrated mats/blooms). This information was used in conjunction with the scientific observations conducted as part of this report, as well as recommendations from IDNR staff to identify areas of concern for an Ecozone(s).

Meeting 2
The second meeting was held at the North Webster Community Center on September 13th, 2006 at 6:30 p.m. There were 34 people in attendance. This meeting coincided with the public meeting on aquatic plant control as required by the Lake and River Enhancement Program (LARE). Attendees were introduced to a variety of concepts related to aquatic plant management and ecology. Interactive educational quizzes were part of the presentation, as well as a review of basic water quality concepts. Historical aerials were reviewed showing the decline and damage to plant communities. Attendees were encouraged to ask questions and offer opinions related to the

causes of such declines. The Ecozone concept was presented as just one step in overall plant management strategies. Significant discussion ensued and finally concluded with the distribution of a written survey soliciting input about three potential Ecozone alternatives.

It is recommended that a final meeting with representatives from the various local interest groups be held with IDNR, Division of Fish and Wildlife and Division of Law Enforcement staff present to answer questions and determine whether adequate public support exists to proceed with a formal petition.

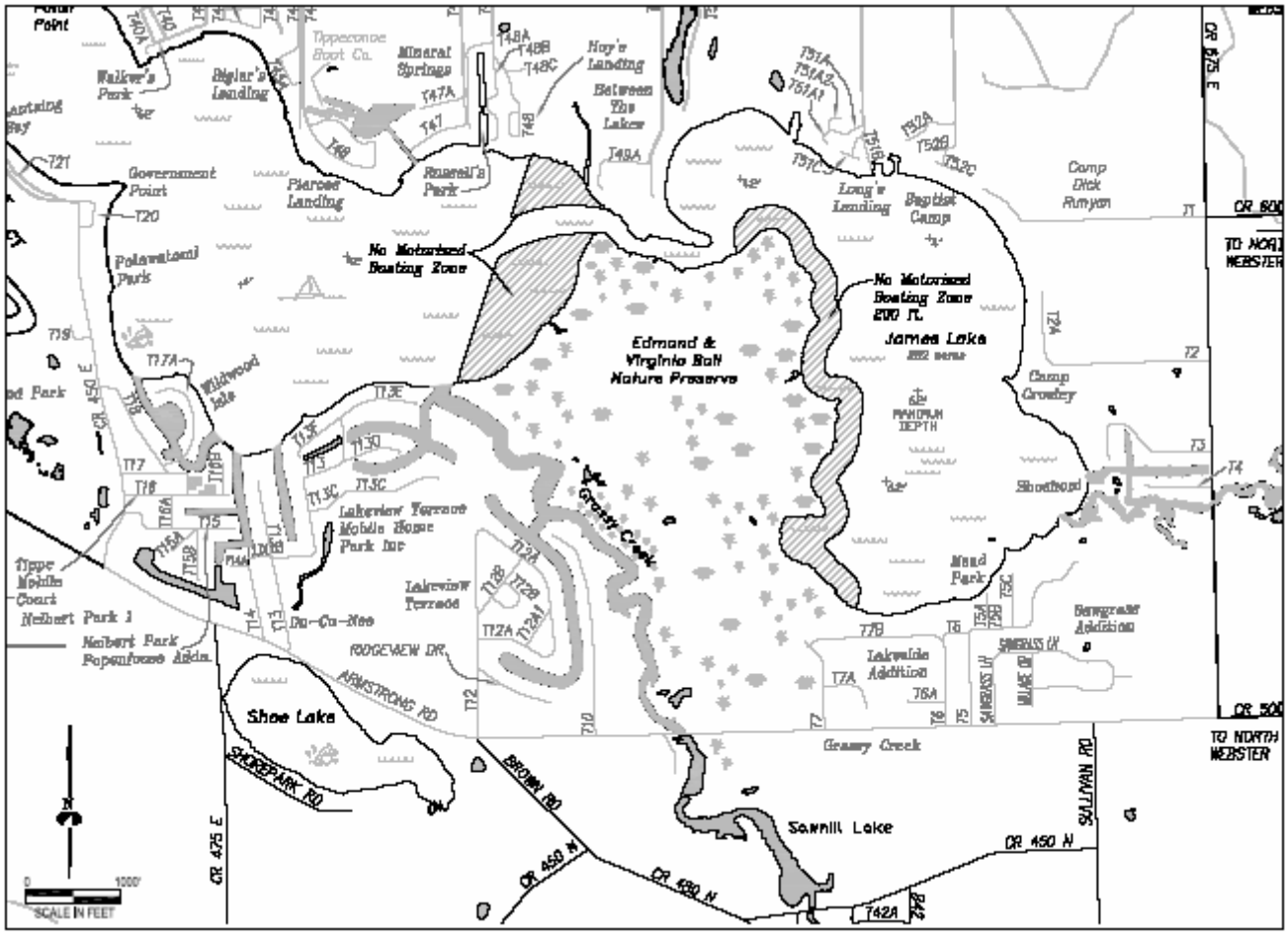
6.0 ALTERNATIVES

6.1 Pre-Shoreline Map Alternatives

Three alternatives (Figures 14-16) for potential Ecozones were introduced to the public and residents present at the second public meeting. A total of 28 surveys were collected with the following results:

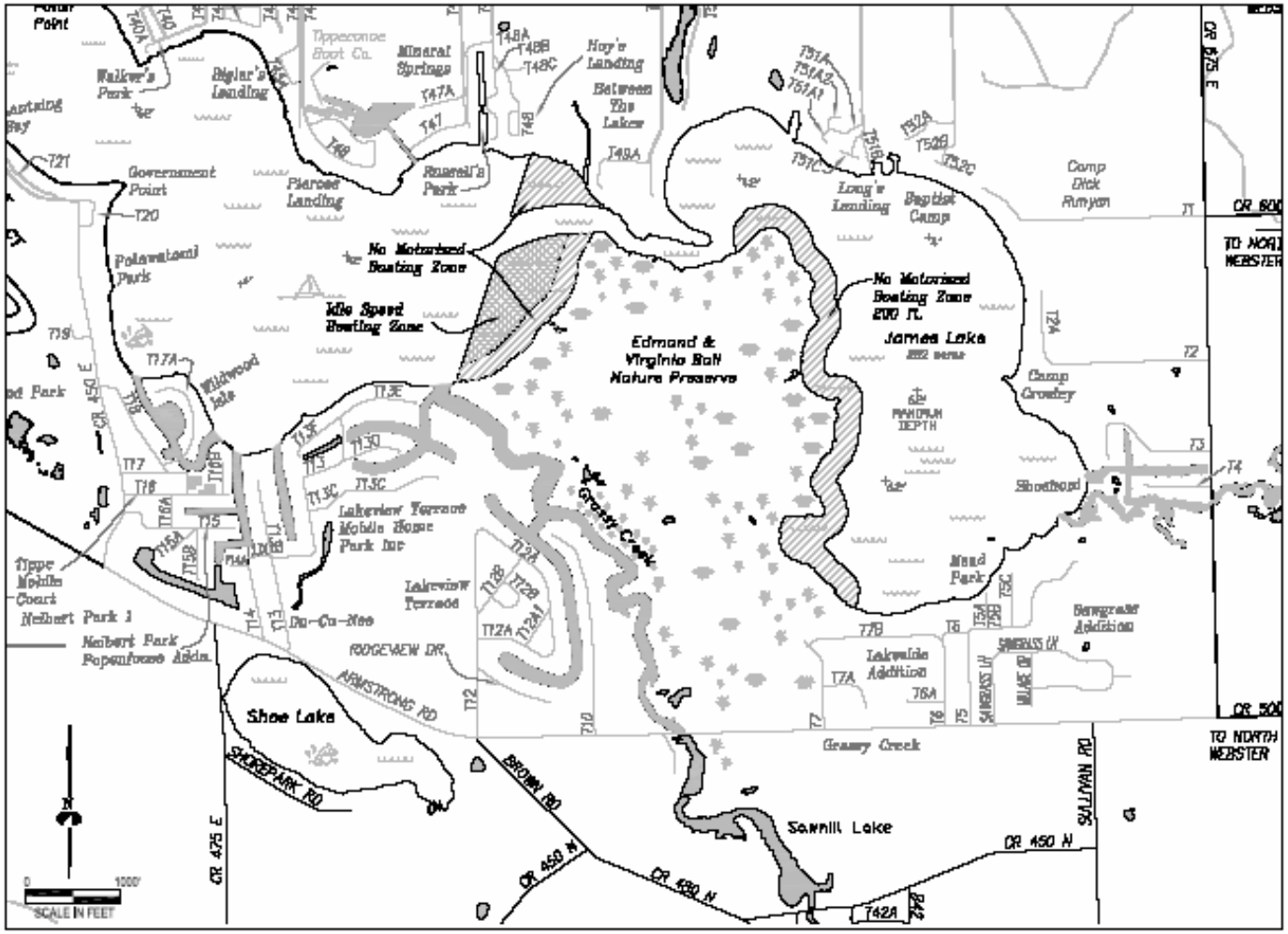
Alternative 1 included a 48 acre area of no motorized boating activity west of the Ball Wetlands and a 200 foot from edge of plants area along the eastern shore received 14 affirmative votes.

FIGURE 23: Alternative 1 from the edge of the Ball Wetlands



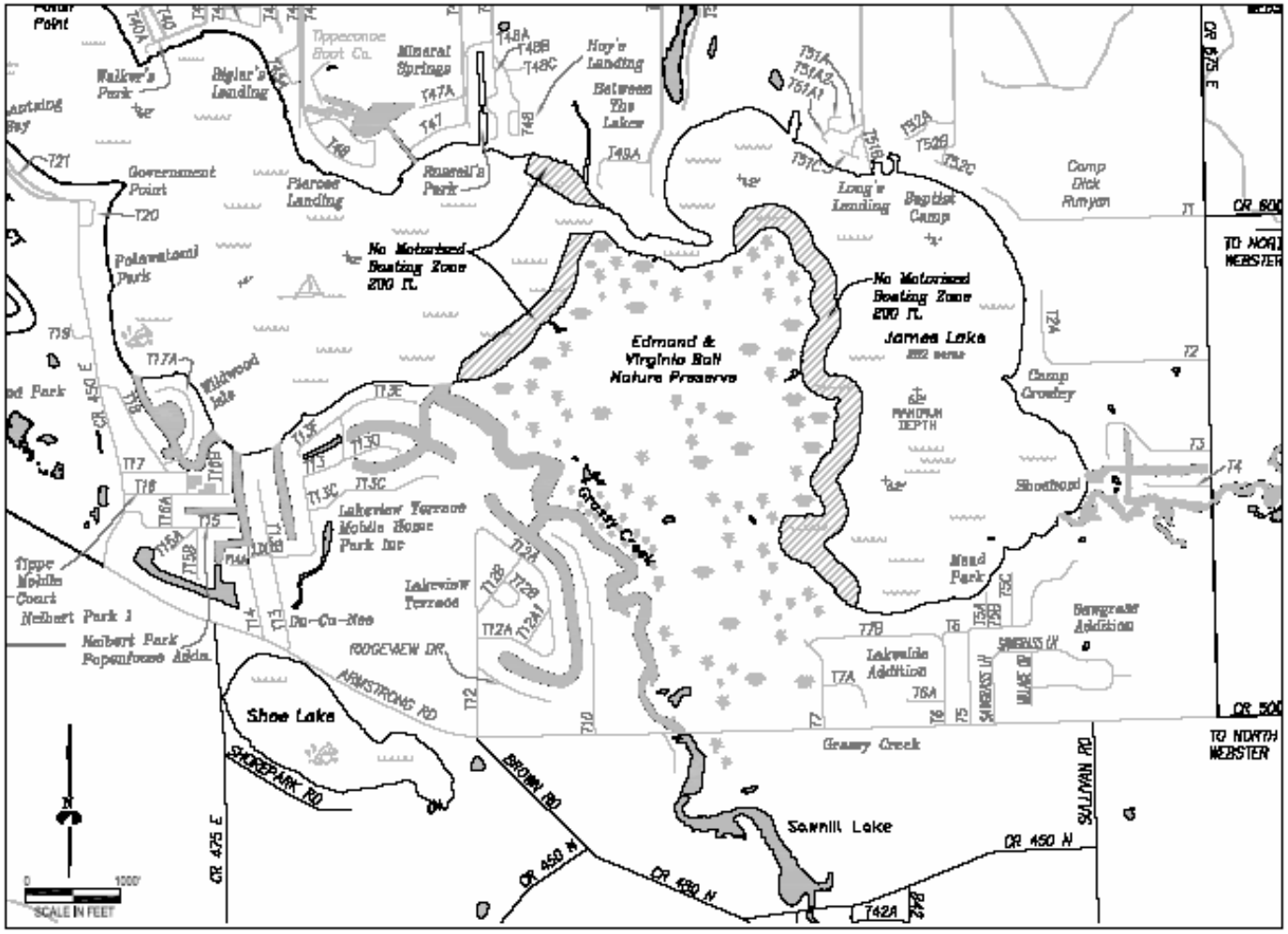
Alternative 2 included the same 48 acre area but half idle speed restricted and half no motorized boating, as well as the 200 feet on the eastern shore received eight affirmative votes.

FIGURE 24: Alternative 2 from the edge of the Ball Wetlands



Alternative 3 included a 200 foot no motorized boats buffer around both shores received one affirmative vote.

FIGURE 25: Alternative 3 from the edge of the Ball Wetlands



Three of the remaining votes were in favor of the Ecozone and suggested: additional areas such as the sandbar on Little Tippecanoe, expanding the 48 acres to something larger, making the 48 acre area idle speed only, and two votes expressing opposition to any boating regulation or zoning.

In the "no motorized boating" zone only canoeing, paddle boats, rowing, or fishing is permitted, electric trolling motors would be allowed, while anchoring would not be allowed. In the "idle only" zone a person must go as slow as possible, not exceeding five miles per hour, so as to maintain steerage, whereby the wake or wash is minimal.

While Alternative 1 would be the most beneficial in restoring the wetlands, it would pose the most restrictions on the recreational hotspot, The Flats. Alternative 2 poses slightly less restrictions on recreational activity, but scouring of substrate by propellers, cutting of plant material, and uprooting of plants by boat hulls may all occur from boats in the idle zone. The least stringent restrictions on recreational activity are proposed in Alternative 3. However, the potential for reclamation of the wetlands in The Flats is diminished significantly because of the decrease in the size of the Ecozone. If no Ecozones were established, native aquatic plant communities would be unable to reestablish themselves. Consequently, the algae communities would continue to grow, therefore, increasing the degradation of the water quality of Lake Tippecanoe. In summary, the more area restricted and the less severity of human interaction, the better the conditions for the native aquatic plant communities to become reestablished. The restoration of these wetlands would improve water quality mainly through the filtration of runoff, and it would also provide habitat for plant and animal species, greatly increasing fish quantity and diversity.

The written survey was distributed and collected to gauge the general popularity of the various alternatives, solicit additional comments/ideas, and guide the Board's decision making process related to petitioning the IDNR. Input from the survey showed strong overall support for some type of zone with a preference for Alternative 1. The LTPO Board was provided this information and voted at a subsequent meeting to petition IDNR for a zone resembling Alternative 1. The Board anticipates petitioning IDNR sometime in the beginning of 2007 to begin the rule-making process for consideration of a "no motorized boating" zone in areas around the Ball Wetlands. The petitioning process is outlined above to assist LTPO in this next step. It is uncertain if the restrictions in boating will create enough of a competitive edge to reestablish the rooted plant community or if additional restoration efforts such as planting live plant plugs will be needed to assist in faster reclamation of the area.

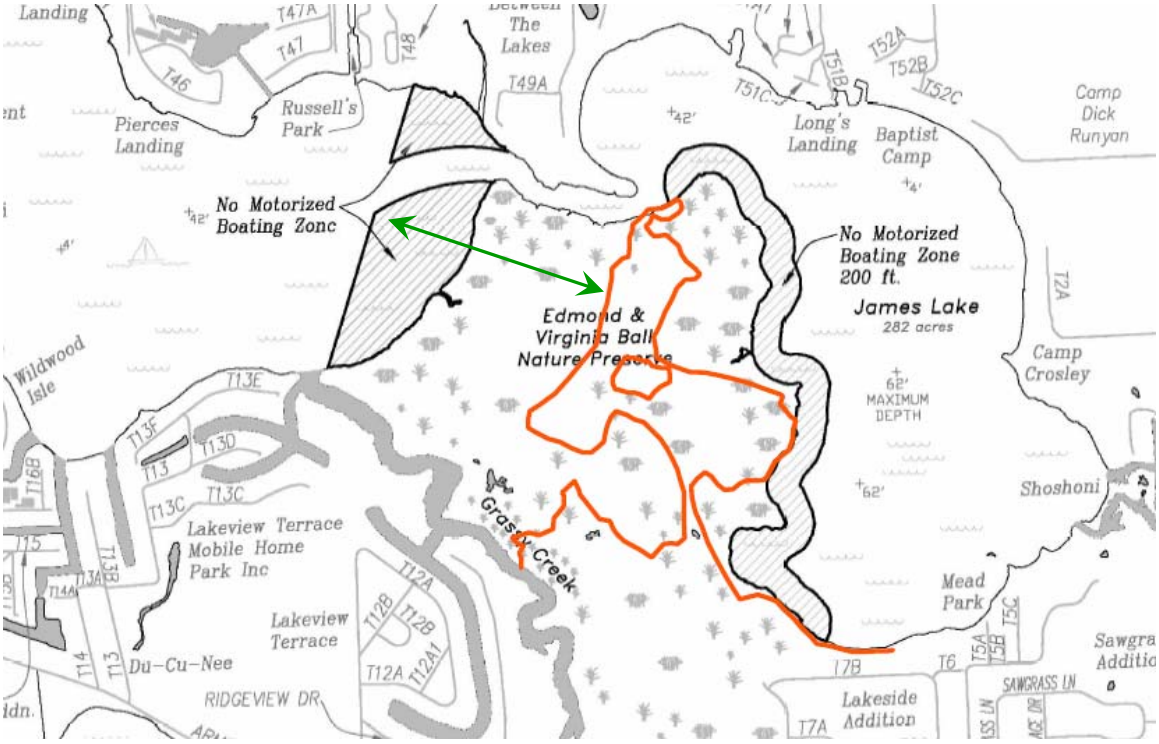
6.2 Post Shoreline Map Alternatives

IDNR provided a map of the legal shoreline of Lake Tippecanoe for the area of the Ball Wetlands. The map differs considerably from the area residents have always considered to be the shoreline along the edge of the wetlands. An aerial photo of the legal shoreline in the Ball Wetland area as delineated by the DNR is included as Figure 26. The legal shoreline marked in yellow is at the elevation of the dry land ending and the beginning of the water at the legal lake level. The most popular alternative was re-measured based on the actual legal shoreline of Lake Tippecanoe. The following results are based on the original alternatives and the legal shoreline.

FIGURE 26: Legal Shoreline Delineation from DNR

Alternative 1 included a 48 acre area of no motorized boating activity west of the Ball Wetlands and a 200 foot from edge of plants area along the eastern shore. When combined with the new legal shoreline information (Figure 27), the area of the proposed ecozone on the west side of the Ball Wetlands is 2,100 feet from the legal shoreline to the west edge of the proposed Ecozone (measured along green line below).

FIGURE 27: Alternative 1 from the legal shoreline



7.0 GOALS AND OBJECTIVES

7.1 Planting Plan

If the petition resembling Alternative one is approved, it is planned that emergent plants such as cattails, arrow arum, arrowhead, and pickerelweed will be established along at least 50% of the waterline within the Ecozone, and at least 50% coverage of the area within the Ecozone will be covered by floating leaved plants such as spatterdock, water lilies and bulrushes.

Based on this planting goal for emergent plants, the actual planting is proposed to take place on twenty five percent of the area originally thought to be the shoreline along the Flats and the Ball Wetland. The "old shoreline" is 2,300 feet in length, 25 % equals 575 feet. Planting six plots 96 feet in length would total the 575 feet. The emergent plots would be five feet in width, planted to arrow arum, arrowhead and pickerelweed on two foot centers. Cattails would be allowed to regenerate at their own rate. The planting costs for each plot would be $360 or $2,160 for the

entire emergent planting. Planted coir logs could be used for wave protection of these plantings if desired. The planted coir logs would add $3,500 per plot for a total of $21,000 for wave protection on all of the emergent plots.

Pricing for an acre of submersed plants on five foot centers is approximately $15,250 per acre. The goal of obtaining 50 % coverage could be obtained by planting 25 % of the area or 12 acres, the total planting price, $183,000. This price is for 1,740 plants per acre consisting of 50 % bulrush and 25 % spatterdock and 25 % water lily. If the amount of spatterdock and water lily are increased the price would increase due to the higher cost of the plant material. Realizing the price of planting per acre, it may practical to wait for the results of the multi-lake re-vegetation results before planting the submersed plants.

TABLE 2: Projected Planting Plan

Predicted Emergent Plants

Common Name	Scientific Name
cattail	*Typha latifolia*
arrow arum	*Peltandra virginica*
arrowhead	*Syngonium podophyllum*
pickerelweed	*Pontederia cordata*

Predicted Floating Leaved Plants

Common Name	Scientific Name
spatterdock	*Nuphar polysepala*
water lily	*Nymphaea*
bulrush	*Scirpus*

These wetland plantings will filter out nutrients and sediment from runoff, allow sediment that reaches the wetland to settle out of the water, reduce the risk of erosion and flooding, provide the needed habitat for diverse fish communities to become reestablished, and act as a nutrient storehouse/sink during the summer months. These characteristics will be self-sufficient, given minimal human impact, and will improve water quality in Lake Tippecanoe.

7.2 Marking Buoys

Based on a conversation between TELWF and Lieutenant John Sullivan, DNR Law Enforcement, the buoys required will total 30. Lt. Sullivan stated the buoys could be funded by DNR. The LTPO have provisions in place for placing and removing the existing buoys and would be able to place and remove the new Ecozone buoys.

7.3 Future Monitoring

It is WCC's recommendation that the area(s) be surveyed annually using the Tier II protocol for a minimum of five years after the establishment of the potential Ecozone(s) to help determine if the Ecozone(s) alone is meeting the ecological objective of restoration. An analysis can be conducted at the end of the five year period to determine if surveying should be continued.

Appendix A

Photographs

Photo 1:
Blue-Green Algae

Photo 2:
Blue-Green Algae on Surface of Lake Tippecanoe

Photo 3:
Coontail

Appendix B

Plant Sampling Data Sheet

Submersed Aquatic Plant Survey Form

WATER BODY NAME: Lake Tippe
COUNTY: Kosciusko
DATE: 8-22-04
CREW LEADER: J. Hoffman
RECORDER: J. Hoffman / Holly LaSalle
SECCHI: 7.8'
MAX PLANT DEPTH: 6.5 in Swimming area
WEATHER: Sunny 85° F
COMMENTS: Secchi 7.8 ft.

Rake score (1, 3, 5), observed only (9), algae present (p)
Use acronyms for species, V1, V2...for voucher codes only

Site	Latitude	Longitude	Depth	All	POCR	MYSP	CEDE	VAAM	ALGA	NUPU	Lily	POPE	Chara	NOAQUS	Note
					Species Code										
1			1				1		3	9					
2			1					1	3		9				
3			1				3			9					
4			1						1	9	1				
5			1				1				9				
6			1						3						
7			4						3						
8			3.5						5						
9			2.5						3						
10			2.5				1		5						
11			2.7			1	1			1	9				
12			5				1		1						
13			2.5				1		3						
14			2.1				3		3						
15			2.5						1						
16			4.2						3						
17			5.2				5		1			9			
18			2.5			9		3	1			1			1st consistant bed
19			1.5					1	1			1			
20			2.0			9		1	1						
21			1.8		9			1	1			1			
22			2.3					1	1			1			
23			2.1					3	1			1			
24			1.7			1		1	1						
25			2.1			9	1	3	1						
26			2.5			9	5		1						
27			2.3										1		Little Tippe
28			6.0											NOVeg	Sand
29			2.5				1						1		
Other plant species observed at lake															

Appendix C

Species Codes

SPECIES CODES

Species Code	Scientific Name	Common Name	Vegetation Type
ALGA	Any species of filamentous algae	algae	Non-rooted floating
CEDE	*Ceratophyllum demersum*	coontail	Submersed
CHARA	*Chara* sp.	a chara sp.	Submersed
MYSP	*Myriophyllum spicatum*	eurasian watermilfoil	Submersed
NLPW	*Potamogeton foliosus*, *P. pusillus*, or other unidentified narrow-leaved pondweeds	narrow-leafed pondweeds	Submersed
NOAQVG		no aquatic vegetation in site	Non-rooted floating
POCR	*Potamogeton crispus*	curly-leaf pondweed	Submersed
POPE	*Potamogeton pectinatus*	sago pondweed	Submersed
VAAM	*Vallisneria americana*	wild celery	Submersed

Appendix D

Public Involvement Information

Lake Tippecanoe Property Owners Annual Meeting
July 8, 2006

GOT WEEDS???

Make Good Water Quality Your Business!

Are aquatic weeds interfering with your recreational enjoyment of Lake Tippecanoe?

Do you understand the role aquatic weeds play in the health of our lake?

Please plan on attending LTPO's annual meeting to hear a presentation on some solutions to the aquatic weed problem.

Presented by: Jill Hoffmann

Williams Creek Consulting

When: July 8, 2006 9:00am Continental Breakfast

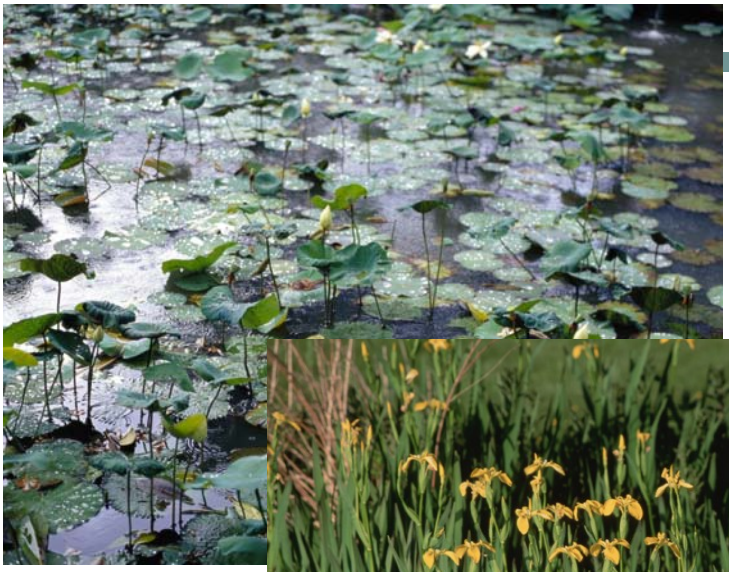
Where: Tippecanoe Lake Country Club

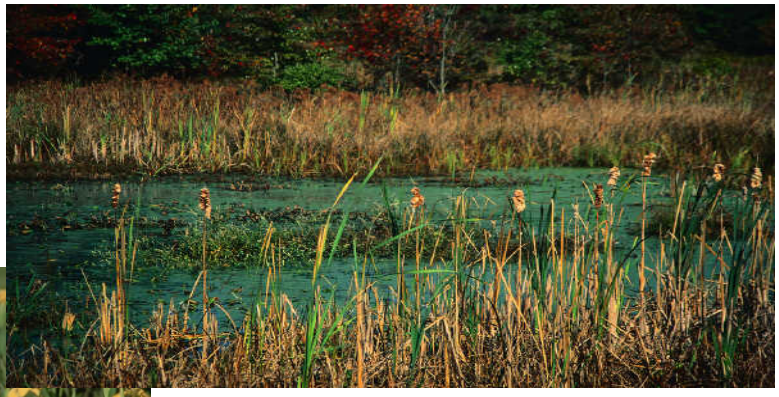
Topic: Ecozone Development, Comprehensive "Weed" Planning, Phosphorus Reduction, & Ideas for the 2007 Aquatic Plant Program

Lake Tippecanoe Property Owners Annual Meeting

P.O. Box 224
Leesburg, IN 46538

Phone: 574-453-4579
E-mail: hayes@kconline.com





LTPO Public Meeting

Do you want to find out more about Lake Tippecanoe's Weeds?

What is beneficial?

What is harmful?

Attend Aquatic Weed & Ecozone Meeting!

September 13, 2006

6:30 P.M.

North Webster Community Building

Presenters: *Nate Long, Aquatic Control*

Jill Hoffmann, Williams Creek Consulting

Sponsored by Lake Tippecanoe Property Owners, Inc.

Used at Public Meeting 09/13/06

Your Thoughts on an Ecozone?

☐ Alternative 1: No motorized watercraft in the 48 acre section of the bay

☐ Alternative 2: No motorized watercraft in the 400-500 ft area (25 acres) and idle speed in the remaining 23 acres

☐ Alternative 3: No motorized watercraft in the 200 ft area

☐ Other Alternative (please describe):

_____

_____

_____

_____

What You Need To Know About the Proposal for an Ecozone on Lake Tippecanoe

During the last several summers many of our Lake Tippecanoe neighbors have noticed an apparent increase in the aquatic plants and algae in several areas around the lake. Aquatic weed treatment and control, and the associated costs, are a topic of discussion at each Lake Tippecanoe Property Owners Board of Directors meeting. Now we are faced with the threat of another invasive aquatic plant species: *Hydrilla Verticillata,* as described in the September 2006 LTPO Newsletter. For the past several months the LTPO Aquatic Plant Management and Water Quality Committees, Lead by their Chairperson Ms. Holly LaSalle, have been investigating specific steps that might be taken to improve our lake water quality and make it less hospitable to undesirable weeds and algae. With the assistance of the Indiana Department of Natural Resources and an Indianapolis based environmental consulting and engineering firm a plan to address our undesirable weed and algae problem has been developed.

The LTPO has long known and supported the special area of ecological interest on the lake known as the Ball Wetlands. The lake water in this area was historically characterized by dense stands of emergent vegetation such as softstem bulrush and floating vegetation such as water lily. It is widely understood that such native aquatic plants make a great contribution to water quality by removing excess nutrients, filtering out suspended solids and also provide wildlife habitat. Concern among residents and lake association leaders regarding the decline of this vegetation and the subsequent replacement of it with mats of filamentous blue-green algae initiated a feasibility study and overall interest in comprehensive plant management strategies. One aquatic plant management strategy gaining interest statewide is the creation of temporary "Ecozones". Locally, Ecozones have been successfully implemented on Lake Wawasee and Manitou Lake to address specific aquatic vegetation degradation problems.

An Ecozone in the shallow water area west of the Ball Wetlands known as "The Flats", would entail limiting negative recreational impacts via recreational use restrictions. Subsequently we would explore the restoration alternatives for the emergent and floating leaf plant community. The guiding ecological principles and practices employed with changes at "The Flats" are expected to mediate:

- the decline in aquatic plant and animal habitat.
- the observed decline in native aquatic plants that provide a more seasonally permanent storehouses for nutrients.
- the overall decline in water quality demonstrated by the presence of blue-green algae blooms.

LTPO sponsored and conducted two public meetings to build ecological understanding and explain Indiana's Ecozone rule making process. Attendees at both meetings were introduced to a variety of concepts related to aquatic plant management and ecology. Historical aerial photos of the Lake Tippecanoe area were reviewed. They clearly showed the decline and damage to plant communities during the last 70 years. Significant discussion ensued and finally concluded with a written

Continued on back...

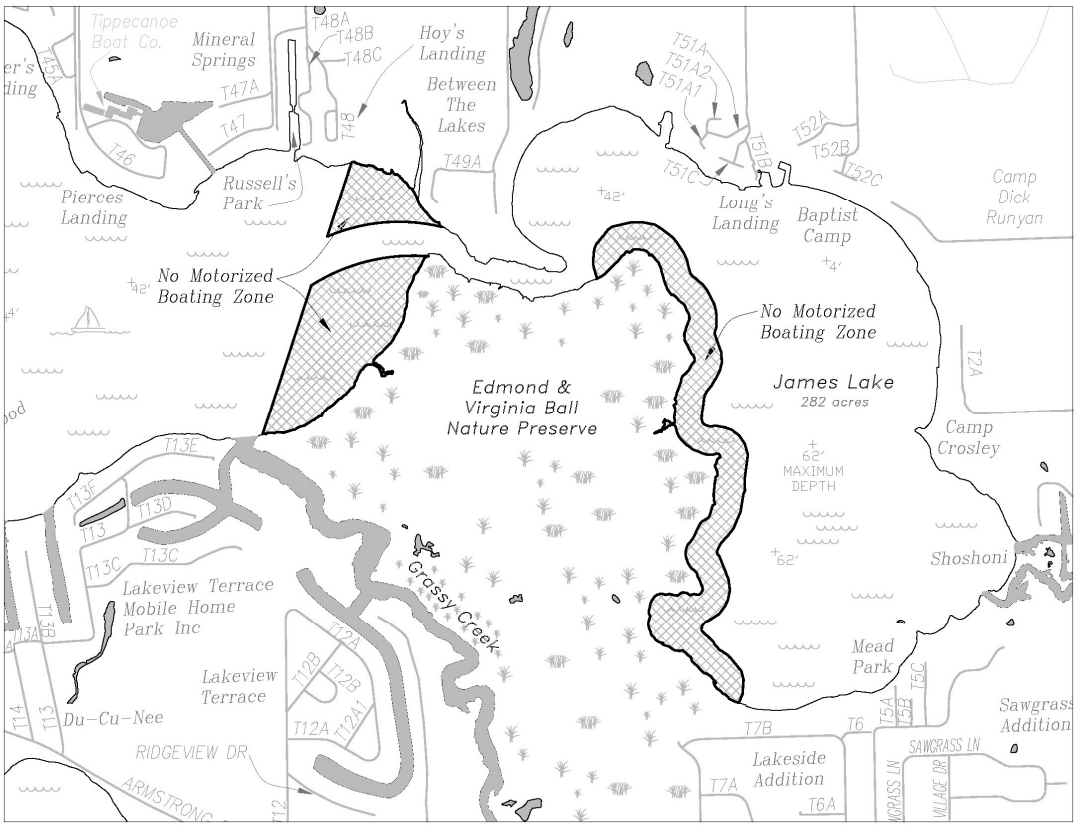
Please take a moment to complete the brief survey on the next page, clip along the dotted line, and return to LTPO in the enclosed envelope.

LAKE TIPPECANOE
Property Owners, Inc.

participant survey soliciting input about three potential Ecozone alternatives. The Ecozone alternative receiving the most affirmative votes was the creation of a 48 acre area of no motorized boating activity both west of the Ball Wetlands (The Flats) and including a 200 foot wide area from the edge of the plant area along the eastern shore of the Ball Wetlands of James Lake (Little Tippy). **See map below.**

The LTPO Board of Directors received a report that summarized these two public meeting and then voted to petition the IDNR for the creation this Ecozone. After the submission of a petition to create a public lake Ecozone, IDNR will study the proposal, announce and hold public hearings and solicit your suggestions and comments. It expected that this process may take 9 – 24 months.

Before a petition to create the proposed Ecozone is prepared and presented to IDNR, LTPO would like to hear from all members of the Lake Tippecanoe community. We have attached a very brief survey to assist you in making your comments known. Please respond to this survey before November 19, 2006. ***Thank you***.



Please answer the following questions and also provide your own additional comments or questions:

* Are you concerned about an increase in Lake Tippecanoe aquatic weeds? ☐Yes ☐ No
* Are you concerned about an increase in Lake Tippecanoe algae beds or mats? ☐Yes ☐ No
* Do you want us to continue with the creation of a Lake Tippecanoe Ecozone? ☐Yes ☐ No
* Would you like more information or to attend an additional meeting about Lake Tippecanoe weeds, algae and the proposed Ecozone? ☐Yes ☐ No

Comments or questions:

_____

_____

_____

Name: _____ Address: _____

City, State & Zip: _____ Phone: _____

Statements from the Survey

Random Order

(Numbered for discussion purposes only)

Copied verbatim from survey forms

1 LTPO continues to do a lot of hard work & good things for our lake. I just wish we would soon begin to hear about plans to address the most important issue our lake faces. SEWER SYSTEM PROCURMENT!
2 I am a fisherman. Would fishing still be allowed?
3 The other Lakes that have ecozones, Wawasee & Manitou, report that they have positive feedback and compliance to the restricted zones.
4 Could fisherman still row or paddle into the Ecozone to fish?
5 Keep up the good work.
6 We would like to see a study conducted concerning the influence of the lack of sewer systems on the aquatic lake life.
7 How wide is boating zone on Little Tippy?
8 The east shore along the Ball Wetlands is now covered with 12" depth of silt which needs to be addressed. Getting rid of the silt, I believe would elimnate many weeds in James Lake.
9 Good Idea!
10 Will there be floating markers to show the "no motorized zones"?
11 Good Luck!
12 Creation of the ecozone must be accompanied by a long term monitoring, measurment & study program so if goals are not being met then the plan can be changed.
13 Fishing and trolling motor should be allowed.
14 All options need to be considered. The weeds are the most pressing problem on the lake.
15 Rather than a straight line from Hoy's landing to Grassy Creek, I'd like to see the eczone confined to just the shallow areas of the flats.
16 Continue the good job!
17 Why not also a sewer system? Check out ozone systems.
18 This past year the "matting" type of weed was worse by far than ever before. Its like a brillo pad. Thank you for your efforts on our behalf.
19 Whatever is best for the lake.
20 Move ahead with the project-the sooner the better.
21 Keep your restrictions on your own lake. The only thing that will help the lake is a sewer system.
22 We greatly appreciate your efforts.
23 We are happy you are working to improve this situation.
24 Complete support.
25 Just do it.
26 What does this zone do to property values in this area?
27 The ecozone needs to happen. Lets do it as soon as possible.
28 This plan will have negligible impact. James Lake should be declared less than 300 acres and converted to fishing/idle speed or restricted hours for speed boats from noon-3:00pm. Same for Oswego.
29 The Ecozone is a good idea. Anyone who has ever taken a motorized boat in those areas realizes how shallow those areas are. I don't understand how the Ecozone works, but if it can help-great!
30 How will this be enforced? Will we need new signs and extra officers, thru the first year?
31 Probably a step in the right direction. Won't solve all the problems. Those areas mostly so shallow we wouldn't go speeding in the area anyhow.
32 This is a recreational lake. No other lake in Kosciusko Co. is as skier friendly. There must be other ways to control the vegatation without taking away the best skiing/wake boearding areas of the lake.
33 There is an algae bed in front of 6-7 trailers on the south shore on the lake from Grassy Creek west that’s about 1 1/2 ft. deep. We can't even walk out into the lake to swim. We have to go to Little Tippy.
34 Is there no way to directly and quickly deal with the aquatic weed problem?

35 These measures may help, but to some extent its window dressing. The real solution is eliminating or replacing septic systems that don't work anymore. We would like to know why everyone refuses to bring this up?
36 More people need to know not to fertilize near the lake… farm runoff people need to be fined for their non-compliance, too.
37 Wiil the new zone increase boat travel & speed with boats going to close to the shoreline?
38 First let me thank you for the work you are doing. I appreciate it. It seems to me that 24 months is an excessive amount of time to hold meetings and get suggestions.
39 Can I still use my 9.9 hp motor?
40 Leave channel for Between the Lakes. Leave channel for Nature Walk. Go 200 ft from Hoys east boundry & east side of Grassy Creek to a point out from the south side of Between the Lakes channel. Add area from Camp Crosley to old Tippy River entrance on S.E. end of Little Tippy, leaving channel open for trailer park. Lets suck all the shit off the bottom between Hoy's channel & Between the Lakes!
41 I agree with the proposed Ecozone on Tippecanoe Lake but against the proposed Ecozone in James Lake. I have indicated an area in James Lake that I have observed and should be further study and designated an Ecozone, except for access to Shoshoni.
42 We appreciate the work you are doing.
43 I think 200 ft is excessive for a no boating zone along the west shore of James Lake on the eastside of the perserve.
44 These areas are already mainly within the idle restrictions and a lot of the bottom is too shallow for motorized activity anyway. Fisherman and hunters are not having the greatest effect on these shorelines. Powerboat generated wakes which may eliminate from long distances are doing the most damage. Seawalls promote " washing machine" effect. This area between the lakes "the narrows" is just as fragile as the rest. Why no restrictions?
45 The lake area needs city sewer.
46 Eliminate the ecozone on the north shore of Big Tippy. This will give a control area to see if the the boat traffic is the problem or if there are other factors.
47 I would like to be kept informed-perhaps additional areas that are adjacent to other wetland areas needs to be considered as well.
48 Who the hell do you people think you are! All you want to do is limit use. It's time you figured out other ways to handle problems.
49 The earth has been dealing with these things for billions of years-only man in his wisdom would want interfer-let nature take its course & take the money & feed the poor.
50 Keep up the good work.
51 We live in Indianapolis year round & get to Tippy as much as possible in the summer. We can only attend meetings when we are in the area. We don't want to hang up our vote by asking for more info.From what we've read & the meeting we attended last summer, we trust those on the scene to proceed with all due diligence.
52 Would like to be kept up to date. Cannot attend meetings usually.
53 If the Ecozone will help our problem, avoiding those areas would be worth the sacrifice. How would those areas be marked to prvent motorized boating?
54 The Little Tippy area is a prine fishing area because there is relatively little high speed boating activity. There is ample vegatation there. Could this be an idle speed area rather than a no motorized zone?
55 We are winter residents in Fort Myers, Fl. Difficult of course to attend a seminar however, we fully support the concerns. Educating the "Lakers" is a vital key to the success of correcting the problem.
56 I would like to be sure that the Ball Wetlands landing dock would be accessable by motorized craft.
57 I'm happy that Lake Tippy prop owners care about the health of the lake, which will make it more beautiful & safe now and in the future. It's a very necessary step & hope more will follow.
58 Is the primary problem actually excessive runoff into the lakes of nitrates & other fertilizers?
59 James Lake is already overloaded with boats from Tippy. To reduce the area for boating is stupid. Are we to go back to 10 mph like before the 70's?
60 I feel the Ecozone on Little Tippy should be an idle zone only.

61 Suggest imposing a sunset provision on the Ecozone such that the viability and impact of the decision can be re-evaluated in the future.
62 During my 14 years as a resident, the quality of Tippy has continued to deteriorate. We could swim off our dock during the early years here. No weeds were present even wading more than knee deep. Let's do something rather than more studies. A sewer system would have the biggest impact.
The ecozone is a bad idea. The open water should be proserved for everyone's enjoyment, not roped off with
63 Would this zone prohibit access to the Wetland pier for wetland hikes.
64 bouys & ropes that will ruin the view of the natural shoreline.
65 How about sewage system.
66 I don't know enough to make an educated decision.
67 It is not the boating causing the problem. Note weeds are the worst where fertilizer from the homes are. Also get rid of the overpopulation of geese & swans that pollute.
68 I appreciate the information. You have my support.
69 Won't the area that I have circled inhibit owners and friends getting to the piers in that area? Also there is a pier to the wetlands in James Lake.
70 1. Suggest the Ecozone have a sunset provision-if it doesn't work we should not be "stuck" with it. 2. Zones must be well marked-the goal is not to provide county with a revenue source in the form of unsuspecting, uninformed boaters.
71 If untreated, what would be the consequences?
72 I don't think I can go along with the 1,000 feet. Maybe 200 or 500 feet.

The Proposed Ecozone on Lake Tippecanoe
An Update of the Status of the Proposal
Winter 2007

During the last year or more your lake property owner's association has been investigating various steps that can be taken to effectively address the growing nuisance aquatic weed problem that seems very evident around our lakeshore. Lake Tippecanoe's aquatic weed problems were the subject of a LARE Grant study last summer that included the sampling of Lake Tippecanoe aquatic weeds and algae during August. LTPO also sponsored public meetings about lake weeds on July 8, 2006 and September 13, 2006. The topic has been discussed by the membership at the monthly LTPO meetings, was a topic of the *President's Message* in the October 2006 LTPO Newsletter and was described in a special survey sent to all Lake Tippecanoe area residents mailed in November 2006.

Based on the suggestions and recommendations of the various environmentalists and biologists that were consulted, a plan to work with the Indiana Department of Natural Resources in the establishment of an Ecozone on Lake Tippecanoe is being pursued. As it would be applied here, an Ecozone would be an area of Lake Tippecanoe that would be "Set Aside", with special usage rules. Photographic records show that during the last 70 years our lake has lost many large areas of native aquatic plants. Ecozones could be established in certain clearly marked shallow areas that would limit or eliminate power boating. These areas could then be replanted with native aquatic plants to replace algae mats that have developed and to restore some of the lake's capacity to remove excess nutrients, filter out suspended solids and also to improve wildlife habitat.

The following background information about Indiana's Ecozones may be of interest to you.

Legislation enacted in 2000 (HEA 1075) amended the IC 14-15-7-3 to allow for the establishment of zones on public waters where the use of watercraft may be limited or prohibited for the purpose of fish, wildlife, or botanical resource management, or for the protection of users. Regulations in 312 IAC 5-6-1 allow for the establishment of zones on specified public freshwater lakes to govern the operation of watercraft for any of the following purposes:

a. Addressing unusual conditions or hazards.
b. Fish, wildlife, or botanical resource management.
c. The protection of users.

In order to be effective, a zone established under this rule must be identified on-site by buoys placed in accordance with 312 IAC 5-4. Watercraft operation may be restricted on specified lakes and reservoirs with state or federal funding under 312 IAC 5-10-1. Ecozones are established through the IDNR's rule making process and are unique to a given lake and geographical area. The boundaries are fixed geographical points and additional rule-making may be undertaken to adjust the boundaries in the future.

Although IDNR clearly has the authority to establish Ecozones on any of Indiana's public lakes it has said that it will not do so unless the local property owners and lake residents request that it be done. During the last few years Ecozones that restricted boating activities have been implemented on both Lake Wawasee and Manitou Lake to address specific aquatic vegetation degradation problems.

Last fall the LTPO Board of Directors voted to continue with an active program to effectively control the lake's nuisance weed problems. That plan consists of **both** an aquatic weed treatment **funding program** and a plan to pursue a petition to the IDNR to establish an **Ecozone** on both sides of the Ball Wetlands as recommended in last summer's LARE Grant Study.

Your LTPO officers also directed that an Information Bulletin and Survey be sent to all 1,400 of the Lake Tippecanoe area property owners and residents, not just current LTPO members, which were listed in the LTPO Database. That survey was prepared and mailed on November 8, 2006.

The Ecozone Information Bulletin and Survey included a map of the proposed Ecozone Area showing the expected "No Motorized Boating" restriction, a place for comments or questions and the following four survey questions:

- ✳Are you concerned about an increase in Lake Tippecanoe aquatic weeds? oYes oNo
- ✳Are you concerned about an increase in Lake Tippecanoe algae beds or mats? oYes oNo
- ✳Do you want us to continue with the creation of a Lake Tippecanoe Ecozone? oYes oNo
- ✳Would you like more information or to attend an additional meeting about Lake Tippecanoe weeds, algae and the proposed Ecozone? oYes oNo

Only 249 survey forms were completed and sent back to LTPO. 98.3% of the respondents checked "Yes" to both questions 1 and 2. Importantly, 93.7% checked "Yes" to question 3.

About 75% of the survey respondents checked "Yes" for the 4th question and there were about 60 survey forms with questions or comments. It is apparent that LTPO has more work to do in its effort to lead the fight against our lake weed problem and to inform our Lake Tippecanoe neighbors concerning the potential costs and benefits that an Ecozone might bring. That is the principal reason that this update has been prepared and sent to you now.

If you want additional information about the proposed Ecozone or if you would like to help or even protest this proposal then please do these three things:

1) Visit the LTPO website at www.ltpo.org to read the latest news about Ecozones.
2) Join LTPO, membership is only $35/Yr., call 574/453-4579 & leave a message.
3) Attend the LTPO board and membership meetings. They are held the third Saturday morning of the month. The next one will be at 9:00 a.m. on January 20, 2007 at the North Webster Community Center.

When you receive additional information about the new LTPO aquatic weed treatment funding program, please look it over carefully. We believe that if most Lake Tippecanoe area property owners actively support this unified approach, then sufficient funds will be available to reach three very desirable goals:

1) Treat our DNR targeted invasive aquatic weeds, using some public funds and some of our own local contributions, efficiently.
2) Fund an effective public education and prevention program that focuses on the consequences of excessive nutrient loading.
3) Properly treat our other nuisance aquatic weeds and special problem areas using our own community funding contributions.

Everyone with an interest in the Lake Tippecanoe community and the ecology of its lakes is encouraged to participate. Please join with your lake neighbors and volunteer to be an active and responsible participant in the Lake Tippecanoe Property Owners, Inc.